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THE EFFECT OF INFORMATIVE AND IMPERATIVE SUBLIMINAL STIMULATION ON CHOICE BEHAVIOUR IN A FORCED-CHOICE SITUATION

by

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ABSTRACT

This study investigated the effects of imperative and informative visual subliminal stimulation on choice behaviour in a forced choice situation. Four hypotheses were examined: (a) the scores obtained by the subjects would be influenced by both, the informative and the imperative subliminal stimulation; (b) subjects receiving the imperative stimuli would obtain higher scores than subjects receiving informative stimuli; (c) both the informative and imperative subliminal stimuli would have a different effect on the scores of the subjects than the identical supraliminal stimuli; (d) the scores of the subjects receiving supraliminal stimulation would not differ from the scores obtained by subjects receiving no stimulation at all.

Two experiments were done. In the first, 21 male and 29 female subjects were divided at random into five groups: (1) control group; (2) subliminal imperative group; (3) subliminal informative group; (4) supraliminal imperative group; (5) supraliminal informative group. The subjects were presented with supraliminal Rorschach inkblot slides. Subliminal or supraliminal verbal stimuli or a blank slide in the case of controls were projected under the Rorschach cards with a duration of two minutes. The subjects had to select two answers from a list of possible responses that was different for each of the ten cards.

The second experiment, using 23 male and 27 female subjects,

was carried out in an identical manner to that of the first experiment except that a neutral gray square was substituted for the Rorschach inkblots. The subjects were thus placed into a maximum uncertainty situation.

The results of both experiments provided support for hypotheses (a), (c), and (d). No support was obtained for hypothesis (b). The question of whether it was the subjects' perception of the supraliminal stimuli (the Rorschach or gray square cards) that was affected by the subliminal stimulation or their choice behaviour, was discussed. It was concluded that under certain conditions where uncertainty is relatively high and response tendency relatively low, a subliminal stimulus containing information relevant to the situation may be able to influence the direction of overt behaviour.

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CHAPTER I

INTRODUCTION

> "Seldom has anything in psychology caused such an immediate and widespread stir as the recent claim that the presentation of certain stimuli below the level of conscious awareness can influence people's behaviour in a significant way. The controversy was precipitated primarily by a commercial firm which claimed that subliminal presentation of the words "EAT POPCORN" and "DRINK COCA-COLA" fantastically stimulated the respective sales of these products among the motion picture audiences who received the stimulation. Despite the fact that detailed reports of the experiment have not been made directly available in any published form, this technique was seized upon as the newest of the "new look" promises of the application of psychology to advertising...The various claims and demonstrations have given rise to a series of charges and counter-charges, the effects of which have reached the United States Congress, and the Federal Communications Commission.' (McConnell, Cutler, & McNeil, 1958, p. 229).

The possibility that one may influence the behaviour of another individual without his awareness presents a certain fascination as well as a certain amount of apprehension regarding dabbling in that which, if true, would seem to pose a threat to personal liberty.

The concept of subliminal perception is not particularly new. It has been around in one form or another for hundreds of years. The idea that people may be affected by stimuli of which they are not aware may have originated with Democritus around 400 B.C.. According to Beare (1906), the statement by this philosopher, that 'much is perceptible which is not perceived by us...', could be taken to imply 'the germ of some such theory as

that of so-called "latent mental modifications", or that of 'perceptions insensibles' afterwards developed by Leibniz.' (Beare, p. 207).

A reference to the possibility of subliminal perception occurs in Plato's 'Timaeus' - 'A process of disturbance of our normal state, if sudden and considerable, is painful, but the return to the normal, on the contrary when sudden and considerable, pleasant; a gentle and inconsiderable process is imperceptible, but its opposite perceptible. And any process which runs its course with facility is eminently perceptible.' (trans. Taylor, 1962).

The notion of imperceptible increments, and perceptible aggregates can also be found in Aristotle. Using the division of a grain of millet by way of illustration, he was more explicit than Plato regarding the fact that the small unnoticed constituents should be considered perceptible - 'for it is potentially so already and destined to be actually so when it has become part of an aggregate.' (Parva Naturalia, 446a).

Aristotle was also the first to invoke the idea of unperceived sensory stimuli having an effect on dreams.

> Impulses occuring in the daytime, if they are not very great and powerful, pass unnoticed because of greater waking impulses.
>
> But in the time of sleep the opposite takes place; for then small impulses seem to be great. This is clear from what often happens in sleep; men think that it is lightning and thundering when there are only

faint echoes in their ears, and that they are enjoying honey and sweet flowers, when only a drop of phlegm is slipping down their throats. (Parva Naturalia, 462b).

Leibniz (1698a & b) was very explicit in speculating about the possibility of subliminal perception.

'There are also numberless perceptions, little noticed, which are not sufficiently distinguished to be perceived or remembered but which become known through certain consequences...In a word it is a great source of error to believe that there is no perception in the soul besides those of which it is conscious.'

He even had something to say on the subject of attention and perceptual defence -

Hence the infinitely wise author of our being arranged it for our good, when he so arranged it that we should often be in ignorance and among confused perceptions, in order to act more promptly by instinct and in order not to be disturbed by too distinct sensations of a multitude of objects, which do not recur immediately and the nature of which could not go on to obtain their ends.

How many insects we swallow without noticing them, how many persons we see, who, having too penetrating an odour, are annoying, and how many disgusting objects we should see if our vision was penetrating enough. (Leibniz, 1698a & b).

Systematic experimental work in the area began in the mid nineteenth century and continued up to the middle of the nineteen fifties. Towards the end of the fifties, the controversy, which occurred with regard to the fears about commercial exploitation of this phenomenon, brought about a sudden, sharp decline in the respectability of work in this area. This resulted in a shift away from direct experimentation in subliminal perception and it is only in the last few years that a resurgence

of interest in the area has been underway.

Some of the earlier research in subliminal stimulation dates back to Suslowa's work in 1863 (Baker, 1937). His experiments concerned the effect of electrical stimulation upon the subject's ability to make two-point threshold discriminations. His results indicated that even when the intensity of the electrical stimulation was so low that the subjects were not aware of its presence, their ability to discriminate one from two-point stimulation was reduced but not eliminated.

Peirce and Jastrow in 1884 showed that subjects could discriminate differences between weights significantly better than chance, even though the differences were so small that the subjects had absolutely no confidence in their judgements (Baker, 1937).

Sidis in 1898 using the criterion of "zero confidence" showed that subjects could reliably distinguish letters from numbers, even when the stimuli were presented at such a distance from them that the subjects thought they were relying on pure guesswork for their judgements (Baker, 1937).

Stroh, Shaw, and Washburn (1908) replicated Sidis's study and obtained essentially the same results. They also found similar results when auditory stimuli (whispers) were presented at a distance such that the subjects were not consciously aware that they were hearing anything.

Miller (1939) did a study in which he presented five geometric figures at four different levels of intensity below the

threshold and found that subjects could still discriminate what was being presented a significant proportion of the time.

Perky (1910) projected images onto a glass window at low intensities. The subjects believed that the images they saw were a product of their imagination rather than perception. Collier (1940), showed that subjects could be made to select certain drawings, even though they were not aware that they were being influenced in their actions.

A series of studies have attempted to show that it is possible to condition subjects to subliminal stimuli. Newhall and Sears (1933), demonstrated that it was possible to establish a weak and unstable conditioned response to light presented subliminally, when the light had been previously paired with shock. McCleary and Lazarus (1949), found that nonsense syllables which had previously been associated with shock produced a greater GSR when presented tachistoscopically at subliminal speeds than did non-shock syllables. Deiter (1954), replicated and confirmed these findings and also showed that when verbal instructions were substituted for the shock no such differences were produced. Positive results of conditioning to stimuli presented to hysterically anesthetic areas and not consciously perceived by the subject have been reported by a number of researchers. A typical study is one by Cohen, Hilgard, and Wendt (1933). They showed that eyelid reflexes to sound could be consistently reinforced or inhibited by presenting a light to the blind area either .045 sec.

(for reinforcement) or .225 sec. (for inhibition) before the sound was presented. They also established a CR to light in the blind area by using a puff of air as the US. The subjects never reported seeing the light.

Although only a few of the earlier studies done on perception without awareness have been cited, these are representative of the type of work that was done in this area. These studies have all purported to have demonstrated that certain stimuli of which the subject was not aware did, nevertheless, influence his behaviour significantly. However, although the results obtained were quite interesting, many of the experiments had methodological inadequacies. For example the posibility that an improvement in discrimination of "imperceptible" stimuli had not occurred was frequently not eliminated. Also evidence of lack of awareness was often not sufficiently complete.

One of the major difficulties in doing research in the area of subliminal perception has been the many different definitions attached to the term subliminal perception. In its most general terms, subliminal perception has been used to describe situations in which: (a) the subject responds to stimuli which fall below his reported level of awareness; (b) the subject responds to a stimulus of which he claims he is completely unaware; (c) the subject reports that he is being stimulated but denies awareness of the stimulus; (d) the subject reports awareness of the stimulus, but denies ever having responded to it; (e) the subject may

report awareness of the stimulus and of making a response, but denies any awareness of a relationship between the two; (f) the subject is aware of responding to a stimulus, but is unaware of the aspect of the stimulus governing his response.

Dixon (1971), outlined three criteria which, if satisfied, would justify the concept of subliminal perception.

> '(1) The eliciting of contingent responses by stimulation below the absolute awareness threshold, where this threshold is itself defined as the lowest level of stimulus energy at which the subject ever reports hearing (or seeing) anything of the stimulus.
>
> (2) The retrospective reporting by the subject that he neither saw nor heard anything of the stimulus.
>
> (3) The occurrence of contingent responses, without reported awareness of the stimulus, that differ qualitatively from those elicited by the same stimulus when presented above the awareness threshold.' (p. 18).

The first two criteria are necessary and sufficient for the subliminal hypothesis to be tenable. The third criterion is neither necessary nor sufficient, as studies examining the effect of subliminal stimulation on various illusions such as the Zollner illusion, (Smith & Henriksson, 1955; Farne, 1963) or the illusion created by the Muller-Lyer figure (Dunlap, 1900; Bressler, 1931), have shown. In these studies the expected responses were the same whether the stimulus was subliminal or supraliminal. However, in studies where the responses are expected to differ depending on the subliminality or supraliminality of the stimulus,

the third criterion becomes a most important one since it suggests that subliminal perception is a separate and distinct phenomenon. These are the criteria which were utilized in the present study.

A number of studies done in a subliminal perception paradigm failed to use a methodology which would utterly exclude the possibility of stimulus awareness by their subjects. Many of the experiments achieved subliminality of the stimulus by backward masking, or metacontrast, as it is occasionally called. This refers to the situation in which a second stimulus which immediately follows a briefly exposed but still supraliminal first stimulus, apparently prevents phenomenal representation of the first stimulus. Studies using this technique work on the assumption that despite the seemingly complete absence from awareness, a backward masked stimulus may, nevertheless, exercise a lingering effect on the subjects' nervous system. Averbach and Coriell (1961), and Sperling (1963, 1967), have demonstrated that complex visual stimuli can be identified and stored even when the brief tachistoscopic exposure is immediately masked by a second stimulus. Sperling found that under these conditions, letters are read from the display at rates approaching 100/second. Fehrer and Raab (1962), in a study on reaction times to masked stimuli showed that reaction times can be determined not only by a stimulus 'that is often not detected by careful phenomenal observation,' but also by 'an event whose presence is not even suspected by the reacting S.' Dember and Purcell (1967), further demonstrated that a backward masked stimulus may enter awareness if the masking stimulus

is itself subsequently masked, thus giving added support to the assumption. However, the question remains whether the masking is 100% effective or some conscious trace remains which under different experimental conditions may manifest itself. Ericksen (1960), summarized his views on this subject in the following way:

> 'If by subliminal we mean that the intensity of cues was too weak to elicit a verbal report threshold under careful psychophysical conditions, then none of the above experiments permit interpretation in terms of subliminal stimulation...Similarily the metacontrast effect seems to depend upon the first stimulus being at a level that would have been detectable were it not 'washed out' by the second stimulation. (p. 294).

A number of studies dealing with the effect of subliminal verbal labels have been reported in the past few years. A study by Klein et al., (1958), was one of the first to deal with this class of phenomena. The experimenters found that drawings and descriptions of consciously perceived ambiguous human figures were influenced by preceding subliminal presentations of sexual pictures and symbols. The drawings were found to be more masculine when they followed a male symbol than when they followed the presentation of a female symbol. However, the results were somewhat ambiguous since it was found that only the effects of the subliminal genitals showed high intrasubject consistency as between the drawings and checklist descriptions of the ambiguous figures; i.e., subjects tended to incorporate attributes of the subliminal stimuli under both, or neither conditions of report.

Smith, Spence, and Klein (1959), did a study in which they

used words rather than pictures as the inducing stimuli. They used twenty male patients who were shown the words 'HAPPY' and 'ANGRY' in a mixed sequence of gradually increasing subliminal exposures. They alternated these tachistoscopic presentations with that of a clearly visible, relatively expressionless male face. They found that the descriptions of the face were significantly more pleasant when the subliminal stimulus had been 'HAPPY' rather than 'ANGRY'. Unfortunately, a bias towards seeing the face as more pleasant than unpleasant whatever the subliminal stimuli, became evident, possibly due to the fact that the face was not as neutral as the experimenters had hoped, suggesting some confounding of the results. In their experiment they also found that presentations at the upper end of the subliminal stimulus range provided no greater effect than those at the lower end. They used this as evidence that partial awareness of these verbal stimuli would not constitute a satisfactory explanation of the data. Smith and Henriksson (1955) obtained similar results also using different exposure times in their study on the effects of subliminal stimulation on the Zollner illusion.

Goldstein and Barthol (1960) carried out two experiments on 'fantasy responses to subliminal stimuli.' Their subjects in the first experiment were required to give responses to TAT cards upon which negative or positive words (ex. 'SUCCESS', 'FAILURE') were projected at subliminal intensities. In this experiment no

evidence was found for any effect by the subliminal stimuli. On the assumption that this was due to the fact that the TAT cards were already too emotionally biased, Goldstein and Barthol did a second experiment in which they used TAT cards that had been deliberately blurred. Under this condition a significant subliminal effect upon the responses to the cards was found. However, in their methodology section the authors say that 'neither spontaneous verbalizations nor detailed questioning of subjects revealed that they had any awareness of the presence of the words overlaid on the TAT slides, although the material was visible to the experimenters,' (p. 23). It seems, therefore, that their results were not entirely free of the possibility of methodological artifacts.

Another study by Henley (1975) examined the effects of subliminal auditory cue words upon judgements of a supraliminal visual stimulus (a neutral face). The experiment was similar to the one done by Smith, Spence, and Klein (1959). Henley's results supported her hypothesis that subliminal material in an unattended channel (the auditory channel) may be integrated with material in an attended channel when it is relevant to the ongoing task. However, in an attempt to reduce the bias of the 'neutral face' used in the Smith et al., study, Henley went too far in the opposite direction, resulting in an obvious bias towards seeing the face as morose. Thus once again the possibility of a methodological artifact can not be ruled out.

Recent investigations into the effects of subliminal stimulation have proceeded into two essentially similar areas of research.

In one area, evidence has been accumulating that drive related subliminal stimuli can have an effect on a subject's drive related behaviour. Over the past few years Silverman has done a number of studies, (Silverman, 1971; Silverman, 1972; Silverman, Candell, Pettit, & Blum, 1971; Silverman, Klinger, Lustbader, Farrell, & Martin, 1972; Silverman, Kwawer, Wolitzky, & Coron, 1973) in which he used pictorial and verbal stimuli at a subliminal level to study the effects of unconscious conflict on psychopathology. A typical study is one measuring the effect of subliminal stimulation on the speech of stutterers (Silverman et al., 1972). The subjects for the study came from a population of adolescent and young adult stutterers who were outpatients at a speech clinic. Both, subliminal and supraliminal conditions were used in the study. The subliminal presentation of a picture of a dog defecating, resulted in increased stuttering on various testing tasks. This did not occur when the picture was presented supraliminally. According to Silverman, the subliminal picture triggered anal drive derivatives in the subjects without their awareness. (In psychoanalytic theory anal drives play an important role in the causation of stuttering.)

In another study, Rutstein and Goldberger (1973) examined the hypothesis that suicidal patients will show increased inward

aggression and depression on presentation of an aggressive stimulus. The subliminal stimuli used in this study contained both pictures and verbal messages. The content of the aggressive stimulus was chosen on the assumption that 'its effectiveness in stimulating unconscious aggressive impulses depended on its ability to involve selectively an early introjected love object (presumably the mother).' (p. 159). The experimenters used a picture depicting a young, menacing-looking woman with a large dagger about to stab an older woman; below the picture was the caption 'DESTROY MOTHER'. Their results demonstrated that the subjects responded to the subliminal aggressive stimulus with depression, however, when they became aware of the stimulus, they reacted with aggressive ideas and images.

Work in the other area of research has been led by the experiments of Shevrin and his associates. (Shevrin & Fritzler, 1968a; 1968b; Shevrin, Smith, & Fritzler, 1970; 1971; Shevrin, Smith, & Hoobler, 1970; Shevrin, 1973). In their work they focused on the effect of subliminal stimulation on certain verbal relationships and transformations. Using rebuses, which are pictorial representations of a word, as subliminal stimuli, they examined the verbal associations that were produced by the stimuli. They also attempted a more direct measurement of the effect of subliminal stimulation by recording brain waves. A typical study is one by Shevrin, Smith, and Hoobler, (1970). They used two similar pictures which were presented subliminally.

One was a picture of a pen and a knee; the other, two geometrical shapes similar to the pen and the knee. Using EEG recordings Shevrin and his associates measured average evoked responses and found a subliminal effect to the extent that the more interesting of the two stimuli (which was the pen and the knee), was associated with a larger amplitude.

Although numerous studies have been done measuring discriminability of subliminal stimuli, or measuring emotionality as affected by drive related subliminal stimulation, or measuring its effect on verbal associations, outside of a few operant conditioning studies, surprisingly little work has been done on the direct subliminal effect on overt behaviour in normal subjects.

In one study Byrne (1959), used the word 'BEEF' which was superimposed on the screen during a 16-minute movie, once every seven seconds for a 1/200 of a second duration. He set out to test four hypotheses: (a) verbal references to the stimulus word are increased; (b) in a choice situation, the stimulus object is preferred; (c) subjectively perceived hunger is greater; and (d) each of these effects is greater under conditions of high physiological hunger drive. The results did not support hypotheses (a) or (d). Hypothesis (c) was significant at the .01 level. Hypothesis (b) was not significant although a higher proportion of the experimental than of the control group subjects (.37 and .28) chose roast beef in preference to other four sandwiches as

measured by a paper and pencil test. However, certain problems become apparent upon closer examination of the study. The sandwich choices included 'hamburger' and 'steak' which are of course beef. It seems highly probable, therefore, that the response to roast beef was 'watered down' as a result of the presence of the other two choices. Also a supraliminal stimulus was not administered as a control measure to compare the possible differences in choice behaviour.

Zuckerman (1960) did a study on 'the effects of subliminal and supraliminal suggestion on verbal productivity.' He attempted to influence the frequency of a graphomotor response using subliminal imperatives. His subjects were student nurses who were shown three TAT cards. Each card was exposed ten times for successive durations beginning at .05 seconds and lengthening to .5 seconds on the tenth trial. After each presentation they were to write about the picture. The experimental subjects in condition II received the imperative 'WRITE MORE' subliminally. In condition III the imperative was 'DON'T WRITE'. The results indicated that the 'DON'T WRITE' imperative was the most effective and resulted in a drop in productivity as compared to the control group which had a rise in productivity. The supraliminal groups, on the other hand, did not show any consistent rise or drop in productivity and were not significantly different from the control group.

Goldstein and Davis (1961), did a study similar to the one

by Smith et al., (1959), in which they attempted to influence selection of supraliminal faces as 'preferred class officers' by high school students. They paired the faces with concurrent subliminal information in the form of the words 'GOOD' or 'BAD'. Their results indicated no subliminal effects. The researchers concluded that although subliminal stimulation may have an effect on a subject's emotional reaction, it does not affect overt choice behaviour. However, it seems that 32% of their subjects reported awareness of the subliminal words under the intensity used, thus casting strong suspicion on the validity of their results.

The results of the studies examining the subliminal effect on overt behaviour have, in general, been relatively inconclusive and open to much criticism on methodological grounds. These studies have dealt basically with motor responses. The question remains, however, whether it was the subjects' motor behaviour, be it choice behaviour or a graphomotor response, that was influenced to some degree, or their perception of the supraliminal stimulus itself. Finally, Zuckerman's use of imperatives as subliminal stimuli has opened the door to some interesting speculation. Is it necessary to use a subliminal imperative in order to influence behaviour in a desired direction or will a subliminal informative stimulus suffice? It would seem reasonable to expect that the imperative stimulus would be a more effective one, since it would not only provide information but suggest a direction for the behaviour as well.

The present study was an attempt to investigate some of the variables involved in a situation where uncertainty about a possible response is increased to a maximum. If a subject must make a forced choice response in such a situation, the uncertainty of which response to select may make the subject more amenable to subliminal influence, since the subliminal stimuli would be providing additional information for him.

Two experiments were done; the first using the responses to the narrower Rorschach Inkblot Test as the dependent measure. In modifying the responses by eliminating the popular choices available to the subjects, (see Appendix A), more uncertainty than is usually the case was introduced into the test. In the second experiment a gray square was used instead of the Rorschach cards in a situation of maximum uncertainty. The experimental designs in both experiments were identical. Three basic conditions were used: a subliminal, a supraliminal, and a control. The first two were further subdivided into imperative and informative forms, for a total of five different conditions in the design.

Specifically, four hypotheses were examined.

(a) The selection of responses would be influenced by both, the informative and the imperative subliminal stimulation.

(b) The imperative stimulus would have a more pronounced effect than the same stimulus in an informative form.

(c) Both the informative and imperative subliminal stimuli would have a different effect on the subjects than the identical

supraliminal stimuli.

(d) Subjects receiving supraliminal stimulation would not differ from subjects receiving no stimulation at all.

EXPERIMENT I

CHAPTER II

METHODOLOGY AND PROCEDURE

Subjects

50 subjects, 21 males and 29 females, were selected at random from an introductory psychology class. They were told only that they were participating in a study designed to measure their responses to the inkblots and were, therefore, totally ignorant of any subliminal procedures. The subjects were informed about the true nature of the study and were debriefed after their data were collected.

Equipment

The Harrower multiple choice test for use with Rorschach inkblots was modified for the purpose of this experiment (see Appendix A). The Rorschach slides were presented on a Bausch and Lomb slide projector and were supraliminal throughout the study. The subliminal and supraliminal verbal stimuli were prepared on slides and were presented using a Keystone mirror slide projector equipped with a tachistoscopic shutter. (See Appendix B for subliminal and supraliminal stimuli). In order to minimize experimenter-subject interaction, the projection was done from another room through movable slots in the wall.

Procedure

The subjects were divided at random into the following five groups: (1) subliminal informative; (2) subliminal imperative; (3) supraliminal informative; (4) supraliminal imperative; (5) control group. The subjects were run in groups of five. Each group was presented with the supraliminal Rorschach slides with a viewing time of two minutes per slide. The projected Rorschach slides had a luminance of 22.50 millilamberts at ten feet, (the subjects were sitting ten feet away from the screen) as measured by a MacBeth Illuminometer. The subliminal stimuli, which of course were different for each slide, had a luminance value of 0.65 millilamberts, for a cumulative luminance value of 23.15 millilamberts. The subliminal value had been determined earlier in a trial run with an additional five subjects. Thus the subliminal luminance value was the point at which the determination of the subliminal stimuli by all the subjects was at the zero level. The trial group subjects knew that subliminal stimuli were being presented but could not see them.

The cumulative Rorschach and supraliminal stimulus value was 24.6 millilamberts.

To prevent any differences that may have occurred due to some variability in the functioning of the equipment, the luminance values were retaken prior to each of the trials and the equipment adjusted accordingly.

Both, the subliminal and supraliminal stimuli were projected

concurrently with the supraliminal Rorschach slides (depending on whether it was a subliminal or supraliminal trial), for the entire duration of the Rorschach presentation. The stimuli were focused on the white space below each inkblot. The control group received a blank stimulus slide in place of the subliminal or supraliminal stimuli.

The subjects received written instructions on what to do. These were as follows:

> You are going to see ten inkblot pictures one after another. Begin by taking a good look at inkblot 1 and see if it, or any part of it reminds you of anything or resembles something you have seen.
>
> Then turn to page 1 and read through the group of answers for card 1.
>
> Now put a 1 beside the one answer in the group which you think is the best description of that inkblot or any of its parts.
>
> When you have done this, put a 2 beside another answer in the group which you also feel is a good description of the inkblot or any of its parts.
>
> Please mark both answers.
>
> Do not turn to the next page until the next slide has

been presented. Then do exactly the same thing for each of the other inkblots.

You will have 2 minutes for each inkblot.

The instructions were also read to the subjects by the experimenter while the subjects followed them on their own.

The subjects' responses were scored in the following manner: Only those responses which were "labelled" via the use of subliminal or supraliminal stimulation were scored and used as a measure of performance. The same responses were, of course, scored in the control group subjects. Three basic performance measures were obtained; one for total responses (i.e., the number of times the "labelled" response was selected as either the first or second choice), one for first choice responses, and one for second choice responses. Separate statistical analyses were performed on each of the measures.

The hypotheses which were examined in this study may now be restated in terms of the scoring criteria. Specifically:

(a) The scores obtained by the subjects would be influenced by both, the informative and the imperative subliminal stimulation.

(b) Subjects receiving the imperative stimuli would obtain higher scores than subjects receiving informative stimuli.

(c) Both the informative and imperative subliminal stimuli would have a different effect on the scores of the subjects than

the identical supraliminal stimuli.

(d) The scores of the subjects receiving supraliminal stimulation would not differ from the scores obtained by subjects receiving no stimulation at all.

CHAPTER III

RESULTS

The mean scores for each of the five groups are summarized in Table 1 for total, first choice, and second choice responses respectively. The analysis of variance was carried out as a 2 x 2 factorial with a single control group (Winer, 1971, pp. 468-473). The results demonstrated a clear indication of a subliminal effect and are summarized in Table 2 for total, first choice, and second choice responses.

For all analyses performed the data were first tested for homogeneity of variance according to the Cochran test (Winer, 1971, p. 208). None of the tests exceeded the .05 level of significance. Therefore, since the null hypothesis was tenable for the between cells variance in all cases, a transformation of the data was not warranted.

In the analysis for total responses the control group proved to be significantly different from the experimental groups, F (1,45) = 8.550, $p < .05$. There was also a significant effect for the liminality factor, F (1,45) = 10.01, $p < .01$. There were no significant differences between informative and imperative stimuli with no interaction between liminality and type. No significant differences were found in the analysis for first choice responses, however, in the analysis for second choice responses a significant effect was found for liminality, F (1,45)

TABLE I

MEAN SCORES OBTAINED ON TOTAL, FIRST CHOICE

AND SECOND CHOICE RESPONSES

		TOTAL		1ST CHOICE		2ND CHOICE	
GROUPS	N	MEAN	S.D	MEAN	S.D	MEAN	S.D
Control	10	3.4	.70	2.0	1.15	1.4	1.17
Sublim Imp	10	4.7	.67	2.1	.99	2.6	.97
Sublim Inf	10	4.4	.97	2.1	1.37	2.3	.67
Supralim Imp	10	4.0	.76	2.4	.84	1.6	1.07
Supralim Inf	10	3.6	.70	1.9	.99	1.7	.82

TABLE 2

ANALYSIS OF VARIANCE OF THE EXPERIMENTAL AND CONTROL GROUPS ON TOTAL, FIRST CHOICE, AND SECOND CHOICE RESPONSES

SOURCE OF VARIATION		TOTAL			IST CHOICE			2ND CHOICE		
	df	SS	MS	F	SS	MS	F	SS	MS	F
Between Cell	4	11.68			1.4			10.28		
Control vs. All Others	1	4.805	4.805	8.55**	.125	.125	.11	3.38	3.38	3.67
Liminality	1	5.625	5.625	10.01**	.025	.025	.02	6.4	6.4	6.96*
Type	1	1.221	1.221	2.18	.625	.625	.53	.1	.1	.11
LXT	1	.025	.025	.044	.625	.625	.53	.4	.4	.43
Error	45	25.30	.562		53.1	1.18		41.4	.92	

* $p < .05$

** $p < .01$

= 6.96, $p < .05$. The difference between the control and the experimental groups although sizable, just failed to reach significance, F (1,45) = 3.67, $p > .05$. No other significant differences were found.

Individual comparisons between groups were done on the three sets of data using Dunnett's t-test. The results for total, first choice, and second choice responses are presented in Table 3. For total results, the subliminal imperative group obtained significantly higher scores, t (1,45) = 3.28, $p < .01$; t (1,45) = 3.88, $p < .01$, than the supraliminal informative and the control group respectively. The subliminal informative group obtained significantly higher scores, t (1,45) = 2.99, $p < .05$, than the control group. Although the scores for the subliminal informative group were higher than those of the supraliminal informative group they just failed to reach significance, t (1,45) = 2.39, $p > .05$. No significant differences were found between the imperative and informative groups under either the subliminal or supraliminal conditions. Also, neither of the two supraliminal groups were significantly different from the control group. No significant differences were found for any group for first choice responses. For second choice responses the subliminal imperative group obtained significantly higher scores, t (1,45) = 2.79, $p < .05$, than the control group. The subliminal imperative group obtained higher scores than the supraliminal imperative group, however, the difference just fail-

TABLE 3

DUNNETT'S t-TEST OF THE EXPERIMENTAL AND CONTROL GROUPS

ON TOTAL, FIRST CHOICE, AND SECOND CHOICE RESPONSES

	TOTAL		1ST CHOICE		2ND CHOICE	
GROUPS COMPARED	DIFFERENCE	t	DIFFERENCE	t	DIFFERENCE	t
Sublim Imp - Sublim Inf	.3	.90	0	0	.3	.70
Sublim Imp - Supralim Imp	.7	2.09	-.3	- .62	1.0	2.33
Sublim Imp - Supralim Inf	1.1	3.28**	.2	.41	.9	2.09
Sublim Imp - Control	1.3	3.88**	.1	.21	1.2	2.79*
Sublim Inf - Supralim Imp	.4	1.19	-.3	- .62	.7	1.63
Sublim Inf - Supralim Inf	.8	2.39	.2	.41	.6	1.40
Sulbim Inf - Control	1.0	2.99*	.1	.21	.9	2.09
Supralim Imp - Supralim Inf	.4	1.19	.5	1.03	.1	- .23
Supralim Imp - Control	.6	1.79	.4	.82	.2	.47
Supralim Inf - Control	.2	.60	-.1	- .21	.3	.70

* $p < .05$

** $p < .01$

ed to reach significance, t (1,45) = 2.33, $p > .05$. No other significant differences were found.

In order to determine if the experimental manipulations had a differential effect on the selection of responses to the different Rorschach cards a 2 x 2 x 10 analysis of variance with repeated measures on the last factor was done on the total and second choice scores (Winer, 1971, pp. 559-567). The results are presented in Table 4. As in the previous analyses, there were significant differences between the subliminal and supraliminal groups, F (1,36) = 9.69, $p < .01$; F (1,36) = 7.90, $p < .01$, for total and second choice responses respectively. However, no significant differences were obtained between the individual cards.

To determine if the sex of the subjects made a difference in the scores obtained, a 2 x 2 x 2 analysis of variance with unequal groups was done on total and second choice responses (Winer, 1971, pp. 599-603). The results are presented in Table 5. No significant differences between the scores obtained by male and female subjects were observed.

An analysis of the factorial data comparing chromatic and achromatic cards revealed no significant differences for either the total scores or the second choice scores. Results are presented in Table 6.

Detailed verbal questioning as well as the subjects' written responses to the questions at the end of the task failed to

TABLE 4

ANALYSIS OF VARIANCE FOR DIFFERENCES BETWEEN CARDS

FOR TOTAL AND SECOND CHOICE RESPONSES

SOURCE OF		TOTAL			2ND CHOICE		
VARIATION	df	SS	MS	F	SS	MS	F
Between Subjects	39	2.777			3.59		
Liminality	1	.562	.562	9.69**	.64	.64	7.90**
Type	1	.122	.122	2.10	.01	.01	.12
LXT	1	.003	.003	.05	.04	.04	.49
Error (Between)	36	2.09	.058		2.9	.081	
Within Subjects	360	94.5			61.6		
Cards	9	1.502	.167	.60	1.29	.143	.79
LXC	9	1.563	.174	.63	.46	.051	.28
TXC	9	.403	.045	.16	.19	.021	.12
LXTXC	9	1.222	.136	.49	.56	.062	.34
Error (Within)	324	89.81	.277		59.10	.182	

* $p < .05$

** $p < .01$

TABLE 5

ANALYSIS OF VARIANCE OF THE FACTORIAL DATA

FOR SEX DIFFERENCES ON TOTAL AND SECOND CHOICE RESPONSES

SOURCE OF VARIATION	df	TOTAL SS	TOTAL MS	TOTAL F	2ND CHOICE SS	2ND CHOICE MS	2ND CHOICE F
Liminality	1	5.39	5.39	8.36**	6.244	6.244	7.78**
Type	1	1.263	1.263	1.96	.118	.118	.15
Sex	1	.213	.213	.33	1.731	1.731	2.16
LXT	1	0	0	0	.842	.842	1.05
LXS	1	.095	.095	.15	.426	.426	.53
TXS	1	.095	.095	.15	.118	.118	.15
LXTXS	1	.213	.213	.33	1.012	1.012	1.26
Error (Within)	32	20.63	.645		25.69	.803	

* $p < .05$

** $p < .01$

TABLE 6

ANALYSIS OF VARIANCE OF THE FACTORIAL DATA FOR CHROMATIC VS. ACRHOMATIC CARDS ON TOTAL AND SECOND CHOICE RESPONSES

SOURCE OF VARIATION	df	TOTAL SS	TOTAL MS	TOTAL F	2ND CHOICE SS	2ND CHOICE MS	2ND CHOICE F
Between Subj.	39	13.887			17.95		
Liminality	1	2.812	2.812	9.7 **	3.20	3.20	8.0 **
Type	1	.612	.612	2.11	.05	.05	.125
LXT	1	.013	.013	.04	.20	.20	.50
Error (Between)	36	10.45	.29		14.50	.40	
Within Subj.	40	44.5			28		
Colour	1	2.112	2.112	1.88	1.25	1.25	1.79
LXC	1	1.013	1.013	.90	.80	.80	1.15
TXC	1	.313	.313	.28	.05	.05	.07
LXTXC	1	.612	.612	.55	.80	.80	1.15
Error (Within)	36	40.45	1.12		25.1	.697	

* $p < .05$

** $p < .01$

reveal any awareness of the subliminal stimuli by any of the subjects. On the other hand, the supraliminal stimuli were clearly visible and all the subjects indicated their awareness of them. An inspection of the answers to the written questions revealed that 80% of all the subjects had difficulty in selecting responses. The most typical reason given was that after looking at the cards they would see things other than those that were listed. As a result, they had trouble deciding which responses to select.

The subjects in the supraliminal imperative group indicated some confusion as to how to react to the imperative stimuli, however, as the results suggest, most of them chose to disregard the imperatives on the cards in favour of the original instructions. No such confusion was evident in the subliminal imperative group since the subjects were not aware of the stimuli.

EXPERIMENT II

CHAPTER IV

METHODOLOGY AND PROCEDURE

Subjects

An additional 50 subjects, 23 males and 27 females, were selected at random from the introductory psychology class. They were told only that they were participating in a study designed to measure their perceptual ability to discriminate imbedded figures and were, therefore, totally ignorant of any subliminal procedures. The subjects were informed about the true nature of the study and were debriefed after their data were collected.

Equipment

The equipment used in this experiment was identical to that of the first experiment described. However, instead of the Rorschach slides a neutral gray square, having a hue of 2.5R and a value and chroma of N5/ as determined from the Munsell Book of Color, was used. It was presented ten times in the same manner as were the Rorschach slides. The group of responses for each of the presentations were identical to those used in the first experiment and so were the subliminal and supraliminal stimuli.

Procedure

The procedure followed in this experiment was identical to that of the first experiment except that the Gray Square slides

were substituted for the Rorschach slides. The luminance values were identical to those in the first experiment. The stimuli were focused on the white space below the square.

Due to the nature of this task the instructions received by the subjects were somewhat different than in experiment 1. These were as follows:

> You are going to see ten cards. Each card contains a square. The ten squares that you are going to see may appear to be identical in all respects. However, within each square there will be a different pictorial representation of one of the descriptions available to you for each of the cards.
>
> Look at the first card carefully. Then turn to the page containing the descriptions for card 1. Now put a 1 beside your first choice. After you have done that put a 2 beside your second choice. Be sure to make two choices.
>
> The representations will be extremely difficult to see, so if you are not sure you may guess.
>
> Do not turn the page until you have been presented with the next card and have had a good look at it. Follow the same procedure for each of the remaining cards.

You will have 2 minutes for each card.

The instructions were read to the subjects by the experimenter while the subjects followed them on their own.

The subjects' responses were scored in the same manner as in experiment 1. Once again the same three basic performance measures were obtained for total, first choice, and second choice responses. Separate analyses were performed on each of the measures.

CHAPTER V

RESULTS

The basic performance measures used were identical with those of experiment 1. The mean scores for each of the five groups are summarized in Table 7 for total, first choice, and second choice responses respectively. As in experiment 1, a 2 factor analysis of variance with a single control group was carried out (Winer, 1971, pp. 468-473). Once again the results demonstrated a clear indication of a subliminal effect and are summarized in Table 8 for total, first choice, and second choice responses.

For all analyses performed the data were first tested for homogeneity of variance according to the Cochran test (Winer, 1971, p. 208). None of the tests exceeded the .05 level of significance and as a result, a transformation of the data was not warranted.

In the analysis for total responses the control group proved to be significantly different from the experimental groups, F (1,45) = 11.84, $p < .005$. There was also a significant effect for the liminality factor, F (1,45) = 26.32, $p < .001$. There were no significant differences between the informative and imperative stimuli. The interaction between liminality and type failed to reach significance, F (1,45) = 2.37, $p > .05$. In the analysis of first choice responses the control group once again proved to be significantly different from the experimental groups,

TABLE 7

MEAN SCORES OBTAINED ON TOTAL FIRST CHOICE

AND SECOND CHOICE RESPONSES

		TOTAL		1ST CHOICE		2ND CHOICE	
GROUPS	N	MEAN	S.D	MEAN	S.D	MEAN	S.D
Control	10	.7	.68	.3	.48	.4	.52
Sublim Imp	10	2.1	.74	1.4	.52	.7	.68
Sublim Inf	10	1.8	.42	1.2	.79	.6	.84
Supralim Imp	10	.8	.63	.3	.48	.5	.53
Supralim Inf	10	1.1	.57	.4	.52	.7	.48

TABLE 8

ANALYSIS OF VARIANCE OF THE EXPERIMENTAL AND CONTROL GROUP DATA ON TOTAL, FIRST CHOICE, AND SECOND CHOICE RESPONSES

SOURCE OF		TOTAL			1ST CHOICE			2ND CHOICE		
VARIATION	df	SS	MS	F	SS	MS	F	SS	MS	F
Between Cell	4	15.4			11.48			.68		
Control Vs. All Others	1	4.5	4.5	11.84***	2.205	2.205	6.81*	.405	.405	1.04
Liminality	1	10.0	10.0	26.32****	9.025	9.025	27.85****	.02	.02	.05
Type	1	0	0	0	.025	.025	.08	.02	.02	.05
LXT	1	.9	.9	2.37	.225	.225	.69	.23	.23	.59
Error	45	17.1	.38		.324	.324		17.5	.389	

* $p < .05$

** $p < .01$

*** $p < .005$

**** $p < .001$

F (1,45) = 6.81, $p < .05$. The liminality factor also proved to be significant, F (1,45) = 27.85, $p < .001$. No significant differences were found for type and there was no significant interaction. No significant differences were found in the analysis of second choice responses.

Individual comparisons between groups were done on the three sets of data using Dunnett's t-test. Table 9 presents the results for total, first choice, and second choice responses respectively. For total results, the subliminal imperative group obtained significantly higher scores, t (1,45) = 4.71, $p < .01$; t (1,45) = 3.62, $p < .01$; t (1,45) = 5.07, $p < .01$, than the supraliminal imperative, supraliminal informative, and the control groups respectively. The subliminal informative group obtained significantly higher scores, t (1,45) = 3.62, $p < .01$; t (1,45) = 2.54, $p < .05$; t (1,45) = 3.99, $p < .01$, than the supraliminal imperative, supraliminal informative, and the control groups respectively. There were no significant differences between either the two subliminal groups or the two supraliminal groups. Neither of the latter two groups were significantly different from the control group.

For the first choice responses the results obtained were similar to those obtained on total results. The subliminal imperative group obtained significantly higher scores, t (1,45) = 4.31, $p < .01$; t (1,45) = 3.92, $p < .01$; t (1,45) = 4.31, $p < .01$, than the supraliminal imperative, supraliminal informative,

TABLE 9

DUNNETT'S t-TEST OF THE EXPERIMENTAL AND CONTROL GROUPS

ON TOTAL, FIRST CHOICE, AND SECOND CHOICE RESPONSES

	TOTAL		1ST CHOICE		2ND CHOICE	
GROUPS COMPARED	DIFFERENCE	t	DIFFERENCE	t	DIFFERENCE	t
Sublim Imp - Sublim Inf	.3	1.09	.2	.78	.1	.36
Sublim Imp - Supralim Imp	1.3	4.71**	1.1	4.31**	.2	.72
Sublim Imp - Supralim Inf	1.0	3.62**	1.0	3.92**	0	0
Sublim Imp - Control	1.4	5.07**	1.1	4.31**	.3	1.08
Sublim Inf - Supralim Imp	1.0	3.62**	.9	3.53**	.1	.36
Sublim Inf - Supralim Inf	.7	2.54*	.8	3.14*	-.1	- .36
Sublim Inf - Control	1.1	3.99**	.9	3.53**	.2	.72
Supralim Imp - Supralim Inf	- .3	-1.09	- .1	- .39	-.2	- .72
Supralim Imp - Control	.1	.36	0	0	.1	.36
Supralim Inf - Control	.4	1.45	.1	.39	.3	1.08

* $p < .05$

** $p < .01$

and control groups respectively. The subliminal informative group obtained significantly higher scores, t (1,45) = 3.53, $p < .01$; t (1,45) = 3.14, $p < .05$; t (1,45) = 3.53, $p < .01$, than the supraliminal imperative, supraliminal informative, and control groups respectively. No other significant differences were obtained for first choice responses. No significant differences were obtained on second choice responses.

A 2 x 2 x 10 analysis of variance with repeated measures on the last factor was done to determine if there were differences between the cards (Winer, 1971, pp. 559-567). The results for total and first choice responses are presented in Table 10. As in the previous analyses, there were significant differences between the subliminal and supraliminal groups, F (1,36) = 27.78, $p < .001$; F (1,36) = 26.0, $p < .001$, for total and first choice responses respectively. However, no significant differences were obtained between the individual cards.

A 2 x 2 x 2 analysis of variance with unequal groups was performed on total and first choice responses to determine if there were significant sex differences (Winer, 1971, pp. 599-603). The results are presented in Table 11. No significant differences between the scores obtained by male and female subjects were observed.

The same type of detailed verbal questioning as in experiment 1, as well as the subjects' written responses to the questions at the end of the task, failed to reveal any awareness of the

TABLE 10

ANALYSIS OF VARIANCE FOR DIFFERENCES BETWEEN

CARDS FOR TOTAL AND FIRST CHOICE RESPONSES

SOURCE OF		TOTAL			1ST CHOICE		
VARIATION	df	SS	MS	F	SS	MS	F
Between Subjects	39	2.39			2.18		
Liminality	1	1.00	1.00	27.78 ****	.91	.91	26.0 ****
Type	1	0	0	0	.01	.01	.29
LXT	1	.09	.09	2.5	.01	.01	.29
Error (Between)	36	1.30	.036		1.25	.035	
Within Subjects	360	47.2			28.1		
Cards	9	.29	.03	.21	.31	.034	.41
LXC	9	.80	.09	.63	.41	.046	.55
TXC	9	.20	.02	.14	.11	.012	.14
LXTXC	9	.01	.001	.007	.42	.047	.57
Error (Within)	324	45.9	.142		26.85	.083	

**** $p < .001$

TABLE 11

ANALYSIS OF VARIANCE OF THE FACTORIAL DATA FOR SEX DIFFERENCES ON TOTAL AND FIRST CHOICE RESPONSES

SOURCE OF VARIATION	df	TOTAL SS	TOTAL MS	TOTAL F	1ST CHOICE SS	1ST CHOICE MS	1ST CHOICE F
Liminality	1	9.42	9.42	26.17****	7.86	7.86	19.17****
Type	1	0	0	0	0	0	0
Sex	1	.39	.39	1.08	.2	.2	.49
LXT	1	.98	.98	2.72	.1	.1	.24
LXS	1	.20	.20	.56	.15	.15	.37
TXS	1	.83	.83	2.31	.68	.68	1.66
LXTXS	1	0	0	0	.05	.05	.12
Error (Within)	32	11.53	.36		13.11	.41	

**** $p < .001$

subliminal stimuli by any of the subjects. The supraliminal stimuli, however, were clearly visible and all the subjects indicated their awareness of them. An inspection of the answers to the written questions revealed that all the subjects in every group resorted to guessing since they could not see anything in the squares. As in experiment 1, the subjects in the supraliminal imperative group expressed some confusion as to which instructions to follow. The results suggest, however, that the subjects generally ignored the imperatives in favour of the original instructions. Three of the subjects expressed the belief that the imperatives were there specifically to confuse them. An inspection of their data revealed that they did not select any of the responses referred to by the projected stimuli. There was little reported confusion in the supraliminal informative group. In fact, this group obtained a higher score than the supraliminal imperative group possibly because the informative stimuli did not interfere with the original instructions to the same extent as did the imperative stimuli and were, therefore, more acceptable to the subjects. This possibility must, however, be approached with caution since the differences between the two groups were not statistically significant. No confusion was evident in the subliminal imperative or informative groups since the subjects were not aware of the stimuli.

CHAPTER VI

DISCUSSION

The three criteria outlined by Dixon (1971) were adhered to throughout the present study. His first criterion, that of 'eliciting of contingent responses by stimulation below the absolute awareness threshold...,' was satisfied indirectly by establishing the threshold for a trial group of five subjects and using that threshold in setting the intensity level for the subliminal stimulation. This was done in order that the subjects in the experimental subliminal groups would not suspect any subliminal procedures.

The question of awareness of the subliminal stimuli, is, of course, of prime importance in any investigation of this phenomenon. The present study was different from previous work in that the criteria for subliminality were much more rigorous than had been used before. The vast majority of experiments investigating subliminal perception employed very brief tachistoscopic presentations to achieve subliminality of the stimulus. However, the durations used varied widely from study to study. As well, few of the experimenters reported the intensities that were employed suggesting the possibility that the Bunsen-Roscoe law may not have been taken into consideration in determining the subliminality of the stimulus. Such problems made it almost impossible to carry out good replications. To avoid these pitfalls, sub-

liminality in the present study was achieved by manipulating intensity rather than duration. In addition, this method had the advantage of controlling for another very important variable. In studies employing brief duration if the subject, for some reason, was not attending, at the time of presentation, to the specific area where the subliminal stimulus was focused, any potential effect the stimulus may have had would be lost. One possible way of controlling for this problem might be to have the subject indicate to the experimenter when he was attending to the area in question or to have the subject himself controlling the presentation of the stimulus. Such precautions were generally not taken. This was not the case in the present investigation. The subjects had sufficient time (two minutes) to scan the entire supraliminal presentation during which time they would also inevitably scan the area where the subliminal stimulus was focused.

Further support that the subliminal stimuli were indeed below the awareness threshold of the experimental subjects was obtained by the satisfaction of Dixon's second criterion that the subjects 'did not report (either verbally or in writing) seeing anything of the stimulus.'

Besides the subjects' written and verbal report, which may or may not be accepted as sufficient evidence, the satisfaction of Dixon's third criterion, by obtaining significantly different scores between the subliminal and supraliminal groups, provided added support for the satisfaction of the first criterion, that

the subjects in the subliminal groups were, in fact, unaware that they were receiving any external incidental stimulation.

It was found in both experiments that the presentation of either type of subliminal stimuli resulted in a significant increase in the scores of those subjects that were receiving it, thus providing support for hypothesis (a). Surprisingly, the results indicated that with the Rorschach cards the subliminal stimuli had their main effect on second choice scores. This occurred in spite of the fact that response tendency was reduced by the removal of the popular responses. In other words, it seems that even though response tendency was reduced, enough of it remained to compete with any possible subliminal influence. This suggested that the subliminal effect was very weak and had little impact on the subjects until their primary choices were satisfied. This possibility was supported by the findings of experiment 2 in which the subjects were faced with a maximum uncertainty situation. Since response tendency was kept down to a minimum in this case, there was little interference and as a result the subliminal influence was exhibited in the selection of the primary choices. A similar effect was found in the Goldstein and Barthol (1960) study. Using TAT cards they obtained subliminal effects only after they deliberately blurred the TAT cards. In effect, they were increasing the uncertainty of the task from the point of view of their subjects.

No support was found in either experiment for the hypothesis

that the imperative stimuli would have a more pronounced effect than the informative stimuli. One possible explanation for this lack of significant differences may be that in situations of relatively high uncertainty where a response must, nevertheless, be made, the presentation of subliminal information may be enough to influence the direction of the response. The subliminal imperative stimuli did not provide any more information than the subliminal informative stimuli. In such a situation the directive component of the imperative stimulus would probably not have increased the frequency of the responses made to any great extent, as they were already being produced as a result of the informative component. The validity of this explanation will, of course, have to await further experimentation into the nature of informative and imperative subliminal stimulation. One such experiment might be carried out in a non forced-choice situation. Possibly if the subjects did not have to respond, then the directive component might play a greater role in influencing the production of responses. Another experiment may be done using within subject measures to compare the effects of the two different stimuli. The within subject measures should give a more powerfull indicator of the effects of the subliminal stimuli.

Some support was found for the hypothesis that the subliminal stimuli would have a different effect on the scores of the subjects than the identical supraliminal stimuli. This is in line with results obtained by other researchers who also found sig-

nificant differences between the effects of subliminal and supraliminal stimuli (Zuckerman, 1960; Silverman, Klinger, Lustbader, Farrell, & Martin, 1972; Rutstein & Goldberger, 1973). Spence and Holland (1962) in their work on the effect of subliminal stimuli on associations, talked about the 'restricting effects of awareness.' They reasoned that the subliminal stimulus bypassed the mechanism for focal attention while the supraliminal stimulus did not. Hebb (1960) speculated that brain mechanisms responsible for conscious experience incorporate some general inhibitory functions which may be fundamental to our whole concept of reality. Maher (1966) talked about a breakdown of the inhibitory processes of normal consciousness in discussing some characteristics of acute schizophrenia.

> Many of the specific defects that are noted in the behaviour of schizophrenic patients seem to consist of the failure to prevent the intrusion of responses other than those demanded by the stimulus situation. Excessive stimulus generalization is easily seen as a failure to inhibit responses to the generalization stimuli. The many phenomena of language and conceptualization are readily interpretable as instances of the intrusion of associative responses that should have been inhibited. Failure to maintain a 'set' or general deficiency of attention is, almost by definition, a failure of inhibitory mechanisms to prevent the continued arousal effects of a multitude of irrelevant stimuli. (p. 436).

In the present study the supraliminal stimuli had the effect of arousing confusion and perhaps some conflict, in the case of the imperative stimuli, regarding which of the instructions to follow. Most of the subjects dealt with this problem by following the original instructions and ignoring the stimuli. As a

result, there was no consistent increase or decrease in the frequency of the labeled responses. No such confusion or conflict was evident in the subliminal groups and the frequency of the labeled responses was significantly higher.

Although the supraliminal groups were different from the control group with respect to their evident confusion, which was not present in the control group since those subjects did not receive any incidental stimulation, the three groups were not different as far as the frequency of the labeled responses was concerned. This provided support for hypothesis (d) which stated that there would be no differences in the scores between the three groups. Similar results were found in both experiments. These results were consistent with those obtained by Zuckerman, (1960) who also found no significant differences between the control and supraliminal groups.

One other question remains to be considered and that is whether it was the subjects' perception of the supraliminal stimuli (the Rorschach or Gray Square cards) or their choice behaviour that was affected by the subliminal stimulation. Although direct evidence bearing on this question is not available from this study, some indirect evidence would tend to suggest that choice behaviour rather than perception was influenced. In experiment 1 most of the subjects reported difficulty in selecting the appropriate responses because when they looked at the Rorschach cards they saw things other than what was available to them on the

list. This was found in all five groups. However, if perception was influenced, then there should have been less difficulty in selecting responses in the subliminal groups as well as fewer reports of any such difficulty. This was not the case, as the data showed. The results of experiment 2 add further support to the evidence against a perceptual effect. In this experiment there was nothing for the subjects to perceive, with the exception of the Gray Square, and yet a definite subliminal effect on choice behaviour was obtained. The results of experiment 2 may possibly be interpreted in terms of imaginary perception. Since the subjects were told in the instructions that there was something in the Gray Squares, it is possible that they imagined that they were in fact seeing something. The subliminal stimulus, therefore, may have acted to modify these imaginary perceptions. This possibility seems unlikely in view of the fact that the majority of subjects reported that they could not see anything and were guessing in making the selections for the correct responses.

On the basis of the evidence presented here it would seem reasonable to conclude that under certain conditions where uncertainty is relatively high and response tendency relatively low, a subliminal stimulus containing information relevant to the situation may be able to influence the direction of overt behaviour.

Much work remains to be done in this area. One possible

direction for further research, as has already been mentioned, would be to investigate the conditions under which an imperative subliminal stimulus may demonstrate a stronger influence than an informative stimulus. Another possibility is based on some work done by Julesz (1965) on texture discrimination in visual perception. The computer generated random dot patterns used by Julesz in his work might be a useful substitute for the featureless Gray Square or the suggestive Rorschach inkblots. Given that type of supraliminal stimulus it might be easier for a subject to visualize some kind of non-random pattern if provided with pertinent subliminal stimulation.

APPENDICES

APPENDIX A

BRIEF BACKGROUND OF THE RORSCHACH TECHNIQUE

BRIEF BACKGROUND OF THE RORSCHACH TECHNIQUE

The Rorschach technique was formally presented to the world in 1921 by Hermann Rorschach in his monograph PSYCHODIAGNOSTIC. Rorschach described how these patterns were produced and selected:

> 'A few large ink blots are thrown on a piece of paper, the paper folded, and the ink spread between the two halves of the sheet. Not all figures so obtained can be used, for those used must fulfill certain conditions. In the first place, the forms must be relatively simple; complicated pictures make the computations of the factors of the experiment too difficult. Furthermore, the distribution of the blots on the plate must fulfill certain requirements of composition or they will not be suggestive...Each blot must be thoroughly tried out before it can be used as apparatus for the test.' (Rorschach, 1951, p. 15).

The inkblots were tested on thousands of people. It soon became apparent that people tended to see certain things in the inkblots and that these varied significantly with the populations studied. Thus, normal subjects tended to give similar responses, while others with emotional or mental problems tended to give different responses. Since their inception, the Rorschach inkblots have been adopted as a major tool in projective psychological testing in numerous clinical settings.

In 1941 Harrower adapted the Rorschach inkblots for group testing using a multiple choice technique. The responses selected for the test were the most representative of the responses obtained in normal presentations of the Rorschach test. The responses selected were categorized into ten classes depending on the response. Thus responses falling into the classes

1-5 were those chosen most frequently by normal subjects. Responses in classes 6-10 were suggestive of some type of psychopathology.

APPENDIX B

MODIFICATIONS OF THE HARROWER RORSCHACH

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The Harrower Rorschach was modified for the purpose of the present study. The responses in classes 1-5 contain certain responses (popular) which are chosen far more frequently than the other responses by normal subjects (Harrower & Steiner, 1951). Since the subjects used in this study came from a normal college population, the most popular responses chosen by normals were deleted from the modified test and other responses not chosen as often were substituted. The criterion used for deletion was selection of the response by at least 30% of the subjects (Harrower & Steiner, 1951).

To make sure that the new preferences formed would be below the deletion criterion, a trial session using the modified test was run. Seventeen subjects, both male and female, were used. They were all university students with a mean age of 22.5. The results are presented in Table A. No new preferences above the 30% cut-off level were formed. The highest percentage obtained for any given response on any given card varied between 18% and 23%.

The reasons for these modifications are as follows: Assuming that subliminal stimuli do exert some influence over a person's behaviour, their effect on the nervous system would be relatively small due to their low energy levels. At the same time the subliminal stimulus has to compete with stronger supra-

TABLE A

PERCENT PREFERENCE ON MODIFIED

HARROWER RORSCHACH TEST

	Rorschach Inkblots									
	1	2	3	4	5	6	7	8	9	10
% Most Popular Response	23	18	18	23	23	23	23	23	18	23
% 2 Most Popular Responses	41	36	36	41	46	41	46	41	36	41

liminal stimuli, which are constantly bombarding the subject, as well as to compete with the subject's personal response tendencies. Therefore, decreasing preference levels on the Harrower Rorschach would have the effect of weakening the response tendencies on this task. This in turn should make the subject more susceptible to subliminal stimulation.

APPENDIX C

STIMULI PRESENTED SUBLIMINALLY AND SUPRALIMINALLY

STIMULI PRESENTED SUBLIMINALLY AND SUPRALIMINALLY

Inkblot 1 ---------- MASK

Inkblot 2 ---------- INDIANS

Inkblot 3 ---------- MONKEYS

Inkblot 4 ---------- SKIN

Inkblot 5 ---------- NUTCRACKERS

Inkblot 6 ---------- RUG

Inkblot 7 ---------- STATUES

Inkblot 8 ---------- EMBLEM

Inkblot 9 ---------- CANDLE

Inkblot 10 ---------- UNDERSEA

The imperative stimuli were formed simply by the addition of the word 'CHOOSE' to the original stimulus. (ex. Inkblot 1 'CHOOSE MASK').

APPENDIX D

RESPONSES USED FOR THE MODIFIED HARROWER RORSCHACH MULTIPLE CHOICE TEST AND THE GRAY SQUARE CARDS

RESPONSES USED FOR THE MODIFIED HARROWER RORSCHACH

MULTIPLE CHOICE TEST AND THE GRAY SQUARE CARDS

CARD 1

_____ AN ARMY OR NAVY EMBLEM

_____ CRUMBLING CLIFFS

_____ STORM CLOUDS

_____ A PELVIS

_____ AN X-RAY PICTURE

_____ PART OF MY BODY

_____ PINCERS OF A CRAB

_____ EYES GLARING AT ME

_____ A HALLOWEEN MASK

_____ ANIMAL HEADS ON A SIDE

_____ NOTHING AT ALL

_____ A BELL IN THE CENTER

CARD 2

_____ LITTLE FACES ON THE SIDE

_____ AN ANIMAL SKIN

_____ A WHITE TOP

_____ BLACK AND RED PAINT

_____ FACES OF INDIANS ON A SIDE

_____ RED AND BLACK INK

_____ NOTHING AT ALL

_____ LUNGS AND BLOOD

_____ AN ERUPTING VOLCANO

_____ A WHITE STING RAY

_____ A LITTLE TEMPLE IN THE CENTRE

_____ FACES CARVED IN STONE

CARD 3

_____ MEAT IN A BUTCHER SHOP

_____ TWO BIRDS FIGHTING

_____ PART OF MY BODY

_____ JUST COLORED BLOTS

_____ MONKEYS HANGING BY THEIR TAILS

_____ AN X-RAY PICTURE

_____ LIPSTICK SPLOTCHES

_____ A COLORED BUTTERFLY

_____ NOTHING AT ALL

_____ FISH SWIMMING

_____ TWO BIRDS' HEADS

_____ FALLING CATS

CARD 4

_____ HEAD OF AN ANIMAL

_____ LUNGS AND CHEST

_____ AN X-RAY PICTURE

_____ AN ANIMAL SKIN

_____ A BLACK SMUDGE

_____ CHARLIE CHAPLIN'S FEET

_____ A PERSON'S INSIDES

_____ A COW'S HEAD

_____ SOMETHING SQUASHED

_____ A LITTLE FLOWER ON THE TOP

_____ BIG OVERSHOES

_____ NOTHING AT ALL

CARD 5

_____ A BIRD'S BEAK

_____ A MAP

_____ A MAN'S FACE

_____ A PELVIS

_____ NUTCRACKERS

_____ NOTHING AT ALL

_____ BLACK CLOUDS

_____ A PAIR OF PLIERS

_____ SHOULDERS

_____ AN ALLIGATOR'S HEAD

_____ AN X-RAY PICTURE

_____ A RABBIT'S HEAD

CARD 6

_____ TWO KINGS' HEADS WITH CROWNS

_____ A LEAF

_____ PARTS OF THE BODY

_____ A LANDSLIDE

_____ MALE AND FEMALE ORGANS

_____ A TOTEM POLE

_____ NOTHING AT ALL

_____ A SNAKE'S HEAD

_____ FEATHERS AT THE TOP

_____ A FUR RUG

_____ AN X-RAY OF THE SPINE

_____ A SCEPTRE

CARD 7

_____ SMOKE

_____ PARTS OF THE BODY

_____ NOTHING AT ALL

_____ BOOKENDS

_____ A GRAY MESS

_____ A WHITE LAMP

_____ MEN'S FACES WITH BIG NOSES

_____ A SQUASHED FROG

_____ AN X-RAY PICTURE

_____ A NECKLACE

_____ BURNING FRAGMENTS

_____ STATUES

CARD 8

_____ AN ORANGE OR PINK BUTTERFLY

_____ SHOULDERS LUNGS AND STOMACH

_____ NOTHING AT ALL

_____ AN EMBLEM

_____ JUST COLOURS

_____ COLORED CLOUDS

_____ A HORSESHOE CRAB

_____ COLORED INK SPLASHED ON PAPER

_____ FLOWERS AND LEAVES

_____ PARTS OF THE BODY

_____ AN X-RAY PICTURE

_____ A DESIGN FOR WALLPAPER

CARD 9

_____ SEA HORSES

_____ JUST SPILT PAINT

_____ SMOKE AND FLAMES

_____ NOTHING AT ALL

_____ A PINK JACKET

_____ A CANDLE

_____ JUST COLOURS

_____ TROPICAL PLANTS

_____ THE STOMACH AND INTESTINES

_____ A FOUNTAIN

_____ A VIOLIN

_____ BLOODY CLOUDS

CARD 10

_____ SPILT PAINT

_____ A CHINESE PRINT

_____ AN X-RAY PICTURE

_____ PARTS OF MY INSIDES

_____ A FLOWER GARDEN

_____ NOTHING AT ALL

_____ UNDERSEA PICTURES

_____ A BLUE FLOWER

_____ BONES

_____ JUST COLORED INK SPOTS

_____ CORAL AND SEAWEED

_____ A DESIGN FOR WALLPAPER

PLEASE ANSWER THE FOLLOWING QUESTIONS:

1. DID YOU HAVE ANY DIFFICULTY IN SELECTING ANSWERS FOR ANY OF THE CARDS? IF YES, BRIEFLY DESCRIBE THE PROBLEMS INVOLVED.

2. DID YOU, AT ANY TIME, SEE OR THOUGHT YOU SAW ANYTHING ELSE ON THE SCREEN OTHER THAN THE CARD? IF YES, PLEASE DESCRIBE.

MANY THANKS FOR YOUR COOPERATION!!!

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